

1 TREEHOPPER AND LEAFHOPPER POPULATION DYNAMICS FOLLOWING SPRING FURADAN ALFALFA STUBBLE TREATMENT

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Abstract

A study was conducted in Mohave Valley to examine population dynamics, economic thresholds, and management strategies for potato leafhopper and treehopper (three cornered alfalfa hopper) in desert alfalfa. In 1998, three distinct peaks of adult treehoppers occurred in August, September, and October. Adult potato leafhoppers were detected earlier in the study, with four distinct peaks noted in June, July, August, and September. Spring Furadan alfalfa stubble treatment reduced initial adult treehopper infestation following application by 40-60% and the initial potato leafhopper infestation was reduced by 25-50%.

Introduction

Carbofuran (Furadan 4F) applied to alfalfa stubble following removal of hay bales from the first cutting in spring can provide effective, economical alfalfa weevil (*Hypera brunneipennis*) control. Length of alfalfa weevil control obtained from this stubble treatment often exceeds 30 days. The effect of this insecticide treatment on population dynamics of other alfalfa insect pests including potato leafhopper (*Empoasca spp.*) and treehopper, or threecornered alfalfa hopper (*Spissistilus festinus*), is unknown.

The green wedge shaped treehopper is approximately 1/4 inch long. Treehoppers girdle alfalfa stems causing affected stems to turn red or yellow, in response to feeding and the deposition of eggs. In northwestern states, treehoppers overwinter as eggs in plant tissues. In milder climates, they overwinter as nymphs and adults, protected by host plants including alfalfa, clover, melons, wheat, and bermudagrass. Young overwintering nymphs and adults begin feeding in spring. Egg laying begins in May or June. In North Carolina, treehoppers are thought to have at least two generations per year, each lasting about 50 days. Populations peak in August and October. In Arkansas, at least three generations were found each season, with population peaks in July, August and September.

The potato leafhopper is approximately 1/8 inch long, wedge shaped, winged, and yellow-green in color. Leafhopper feeding may cause stunted growth and yellowed alfalfa plants. A yellow wedge shaped area at the tip of the alfalfa leaflet is a characteristic symptom of leafhopper feeding. Females live a month or more. Three to ten days after mating, female leafhoppers deposit two to three eggs into stems, petioles or leaf blades daily. Eggs hatch

in seven to ten days producing wingless nymphs which go through five molts and become fully grown winged adults in about two weeks. Three to four generations a year, each lasting about 3 to 4 weeks occur in North Carolina. In the Central Valley of California, leafhoppers may be found throughout the year with population peaks in July, August, and September.

Suggested guidelines for integrated pest management (IPM) strategies for these insect pests in alfalfa are based on economic thresholds developed in Nebraska and Texas. According to the University of Nebraska, leafhoppers control may be justified when the following numbers of leafhoppers are present at the corresponding alfalfa stem heights: 2 per sweep at 12 inches tall, 1 per sweep at 8-10 inches tall, 0.5 per sweep at 6 inches tall, and 0.2 per sweep at 3 inches tall. According to Texas A&M University, treehopper control may be justified when numbers exceed 1.5 to 2 treehoppers per sweep up to 10 days prior to cutting.

Most research on potato leafhopper and treehopper population dynamics in alfalfa hay has been conducted in the midwestern and northwestern United States. Little field research data exist at this time on life cycles or economic control thresholds for leafhoppers and treehoppers in desert alfalfa. A study was conducted in Mohave Valley to examine population dynamics, economic thresholds, and management strategies for leafhoppers and treehoppers in desert alfalfa.

Materials and Methods

One field experiment was conducted in established CUF 101 alfalfa for two years during 1998-99 in Mohave Valley, AZ located in western Mohave County to determine the effect of early spring Furadan insecticide stubble treatments on leafhopper and treehopper population dynamics. Two treatments consisted of an untreated control and a Furadan stubble treatment applied following bale removal from the first spring cutting. Individual plots were 65 feet wide by the length of the irrigation run (830 feet), and the two treatments were replicated six times. Furadan 4F was applied by air at 1 qt/acre with 5 gal water/acre to alfalfa stubble on April 20, 1998 and March 10, 1999.

Each plot was sampled for insects with a sweep net taking 20-90° sweeps at two locations within each strip on a weekly basis and identifying and counting the contents. Periodically, following baling, bales within each plot were counted and individual bales weighed at random at the field moisture percentage which was not determined. Statistical analyses were performed on the data using ANOVA and the least significant difference (LSD) test at the 0.05 level of probability when appropriate.

Results and Discussion

1998:

In 1998, three distinct adult treehopper population peaks (or possible generations) seemed were detected on or about August 1, September 1, and October 15 (Figure 1). Two overlapping generations appeared to occur from August through early November. The first adult treehopper population peak (possibly the first generation) occurred from July 20 to August 19, the second peak was from August 26 to September 3, and the third peak was from September 16 to November 4. In terms of heat unit accumulation (86/55°F), the first adult treehopper population peak occurred approximately 2500 heat units after January 1. Subsequent adult treehopper population peaks (generations) required 850 to 900 heat units.

Mid-April Furadan alfalfa stubble treatment significantly reduced first generation treehopper numbers by 40 to 60%, compared to untreated plots. Residual treehopper control diminished by the second and third generations. However, spring Furadan alfalfa stubble treatment did keep first and second generation treehopper numbers below the suggested economic threshold of 2 leafhoppers/sweep.

Four distinct adult leafhopper population peaks or (or possible generations) were detected on or about May 28, July 15, August 12, and September 16 (Figure 1). Several overlapping generations seemed to occur from mid-May through early November. The first adult leafhopper population peak occurred from May 20 to June 25, the second peak was from July 8 to July 20, the third peak was from August 6 to August 26, and the fourth peak was from September 16 to November 4. In terms of heat unit accumulation (86/55°F), the first adult leafhopper population peak occurred approximately 1200 heat units after January 1. Subsequent adult treehopper population peaks required 800 to 950 heat units.

Leafhopper populations had a tendency to begin building on alfalfa stubble soon after cutting and baling, peak approximately two weeks after baling, and decline again as alfalfa hay neared harvest. It is possible that adult leafhopper population peaks were caused by infestations following migration from adjacent mature alfalfa fields into the study field shortly after it was harvested. Mid-April Furadan alfalfa stubble treatment significantly reduced first generation leafhopper numbers by 40 to 50% and second generation leafhopper numbers by 25 to 35%.

Alfalfa hay yields were determined within each plot on July 29. Spring Furadan stubble treated alfalfa plots averaged 1.6 ton/acre, compared to untreated plots that averaged 1.4 ton/acre. At \$75/ton, this significant tonnage difference returned \$15/acre for one summer cutting. Hay yields were not determined at the May 18 cutting, but a similar yield increase at this time with \$110/ton hay would return \$22/acre. Hay quality also was not determined.

Potato leafhopper populations peaked in early spring approximately two months prior to the appearance of significant treehopper numbers. Leafhoppers seemed to prefer succulent new growth of alfalfa with populations peaking about two weeks after baling. Treehoppers were found in high numbers throughout the alfalfa growing cycle. Cutting alfalfa hay did not significantly reduce leafhopper or treehopper infestations.

1999:

As of August 11, one distinct adult leafhopper population peak, or possibly the beginning of the first generation, was detected on or about August 4 (Figure 2). This population peak lasted from July 28 to August 11. In terms of heat unit accumulation (86/55°F), the first adult treehopper population peak occurred approximately 3000 heat units after January 1.

As of August 11, two to three distinct adult leafhopper population peaks (or possibly overlapping generations) were detected on or about May 19, July 7, and August 4 (Figure 2). The first adult potato leafhopper population peak occurred from April 28 to June 3 and the second peak occurred from June 23 to July 14. A third adult population peak began to build on July 28 and appeared to peak on August 4. In terms of heat unit accumulation (86/55°F), the first adult leafhopper population peak occurred approximately 1200 heat units after January 1. Subsequent adult leafhopper population peaks required approximately 800 to 1000 heat units.

Mid-March Furadan alfalfa stubble treatment significantly reduced first generation leafhopper numbers by 25 to 35%. In contrast, 40 to 50% leafhopper control was observed for the first 1998 infestation, possibly due to the later Furadan application date in mid-April which controlled both nymphs and adults. Furthermore, the June 30 Lannate insecticide application for cutworm and alfalfa caterpillar control seemed to keep second generation potato leafhopper numbers at lower levels than those observed in 1998.

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